

Caltech

New Horizons: First Scientific Results

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(For the New Horizons Team, Alan Stern, P.I.)

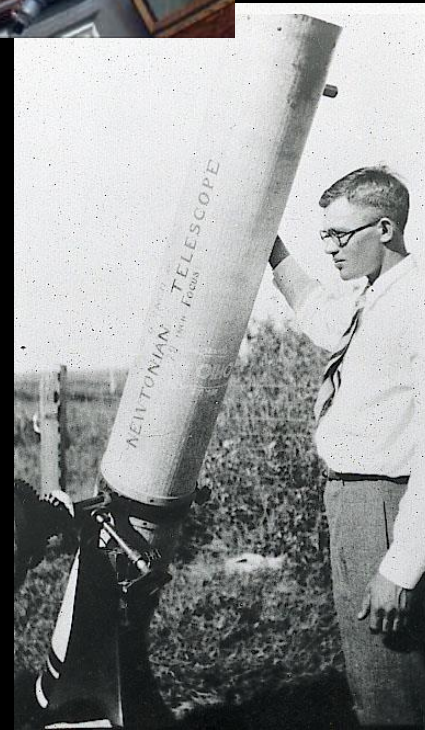
***Principal Scientist, NASA Jet Propulsion
Laboratory, Caltech***



Discovery of Pluto (1930)



*Percival Lowell
(1855-1916)*



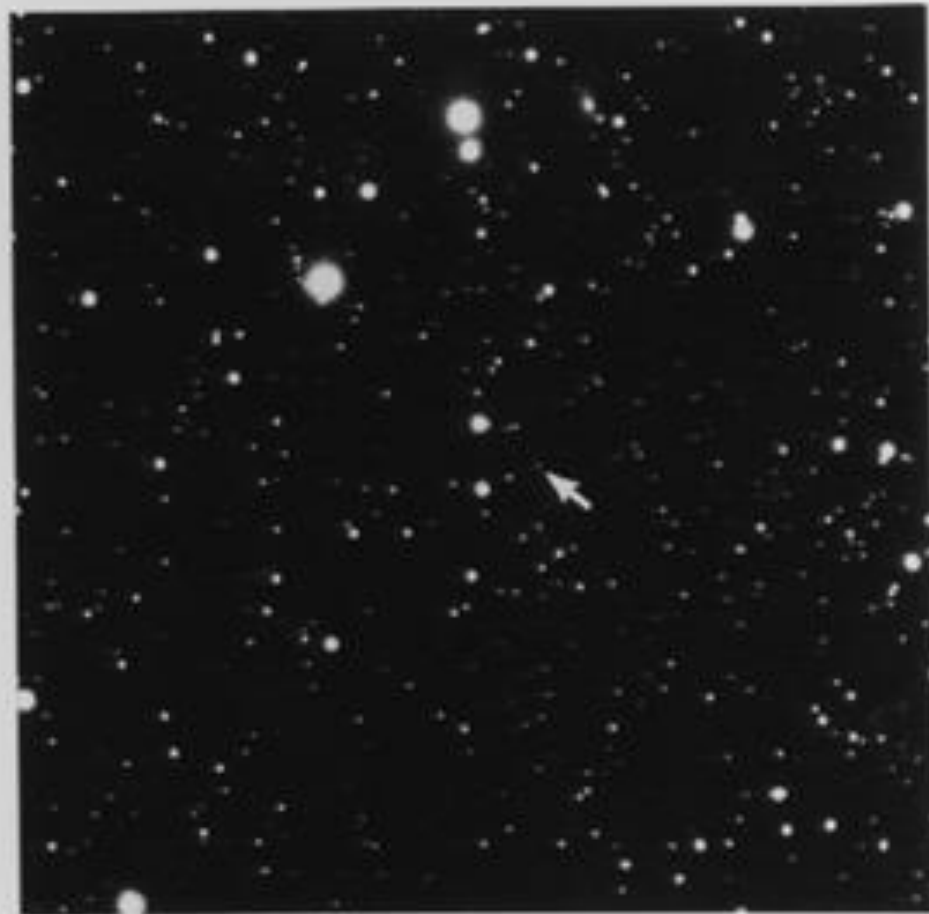
*Clyde Tombaugh
(1906-1997)*



DISCOVERY OF THE PLANET PLUTO



January 23, 1930



January 29, 1930

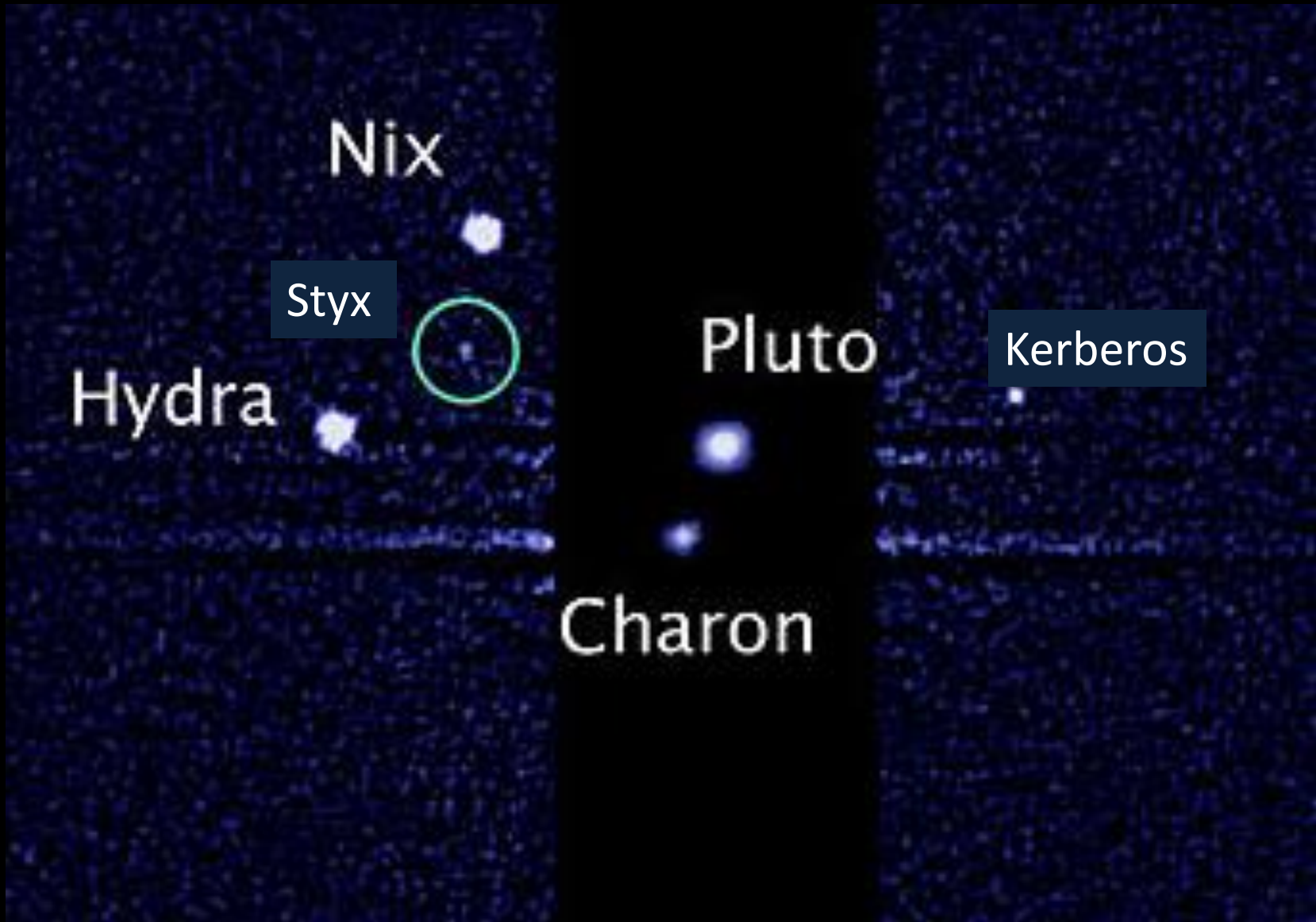
Discovery of Pluto's main moon (1978)



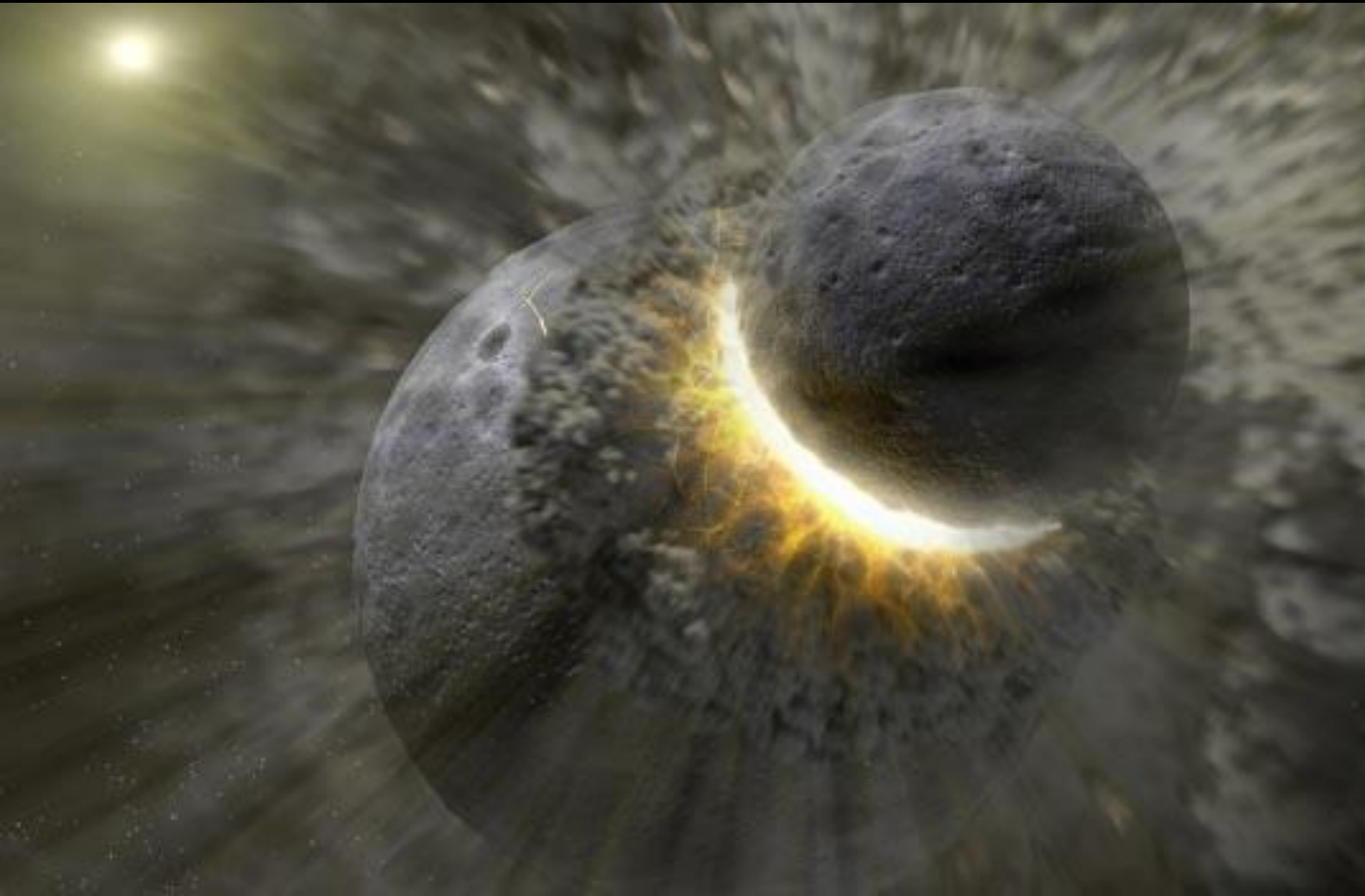
*The discovery photograph
(Pluto + Charon; Charon
Is the blob)*

Christy & Harrington

Hubble: July 2012

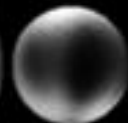


The origin of Charon?



The clearest map of Pluto prior to New Horizons (Buie et al., 2010)

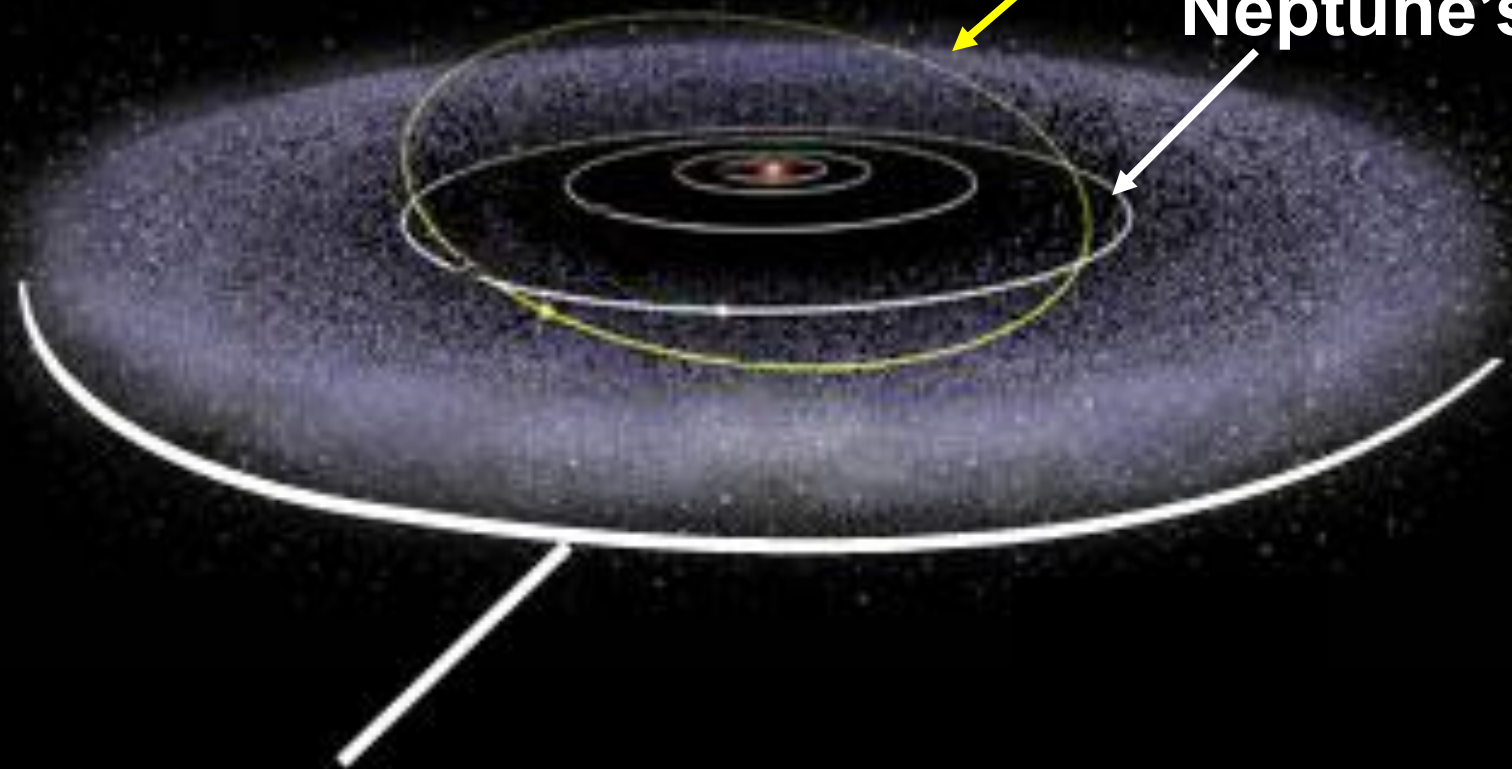




The Third Zone

Pluto's orbit

Neptune's orbit



The Kuiper Belt

***Triton (Neptune moon)
What we expected to see
(What we didn't see)***



New Horizons

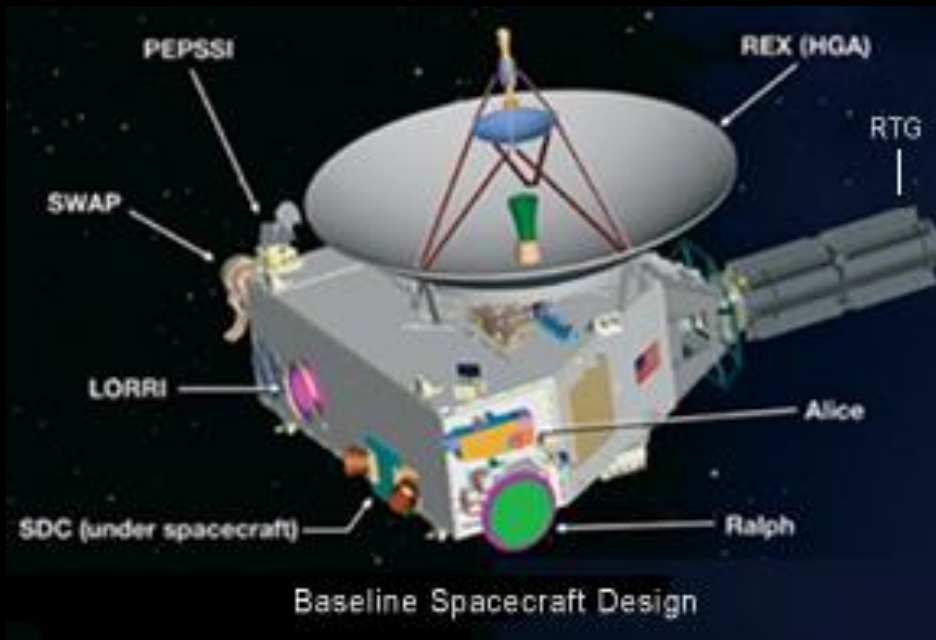


Finally, a mission to complete the inventory

New Horizons: Mission Objectives

- **Map surface composition of Pluto & Charon**
- **Characterize geology and morphology of Pluto, Charon & new satellites**
- **Characterize the atmosphere of Pluto and its evolution**
- **Search for an atmosphere around Charon**
- **Map temperatures on Pluto & Charon**
- **Search for rings and additional satellites around Pluto**
- **PLUS... conduct similar investigations of one or more Kuiper Belt Objects**

New Horizons: Basics



Ralph: Visible and IR spectrometer: composition and temperature of surface of Pluto, Charon, and new moons

Alice: Ultraviolet spectrometer: atmospheric detection and structure

LORRI: Camera to study geology; look for moons and rings

REX: Radio science experiment: atmospheric temperature and composition

SWAP: Solar wind studies

PEPSSI: Energetic particle detector

SDC: Student dust counter

<http://pluto.jhuapl.edu>

Mission profile

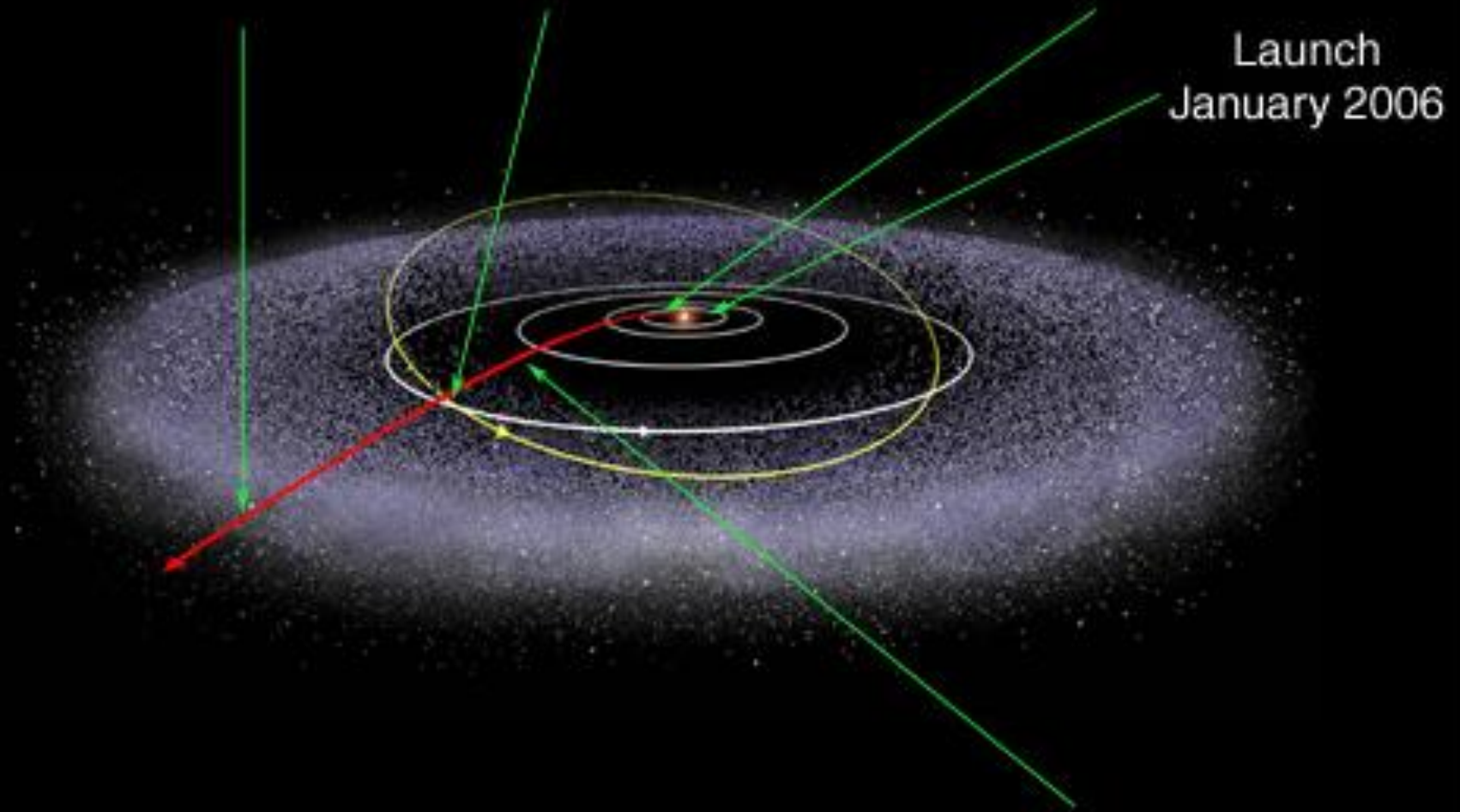
KBOs
2016–2020

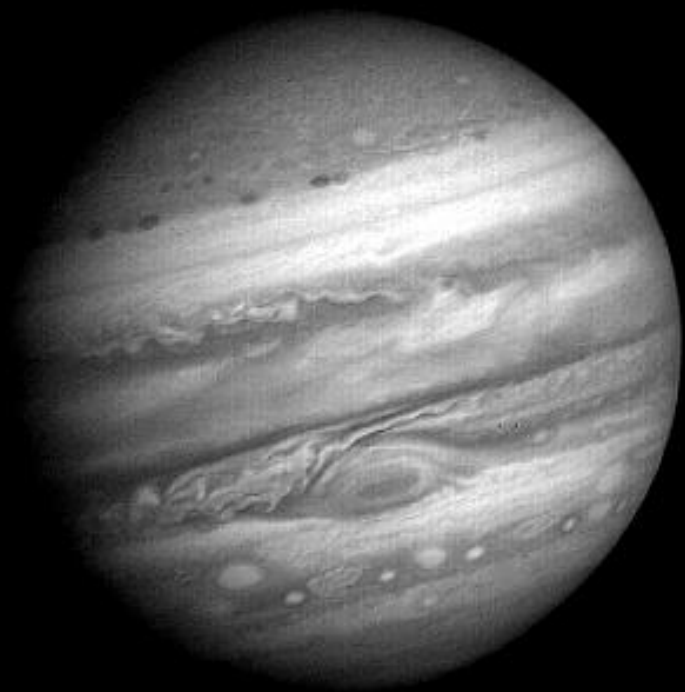
Pluto-Charon
July 2015

Jupiter System
February 2007

Launch
January 2006

Interplanetary Cruise
March 2007—June 2015

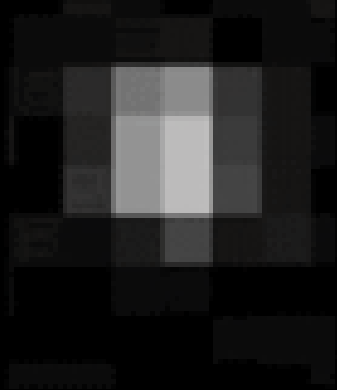


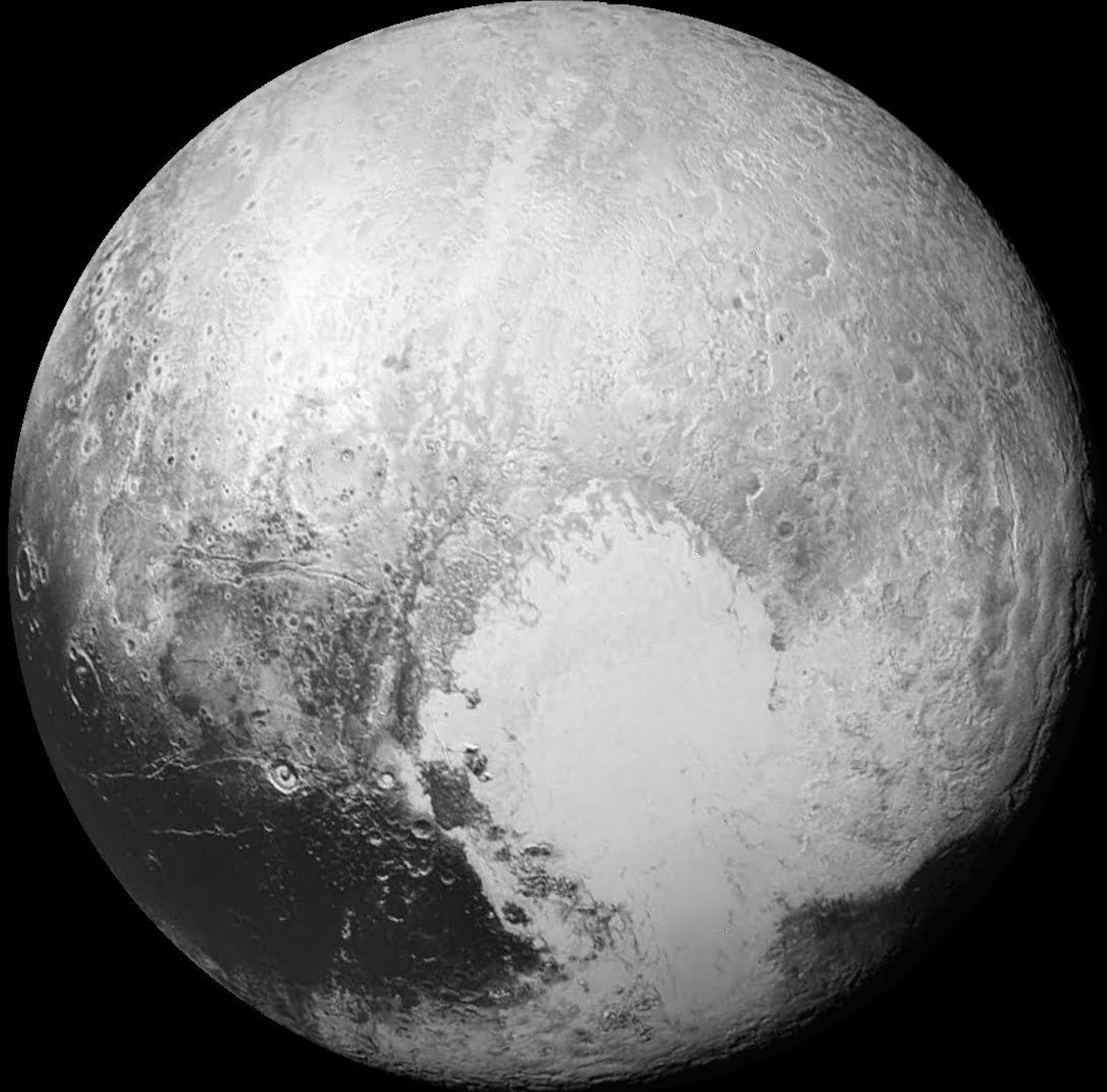


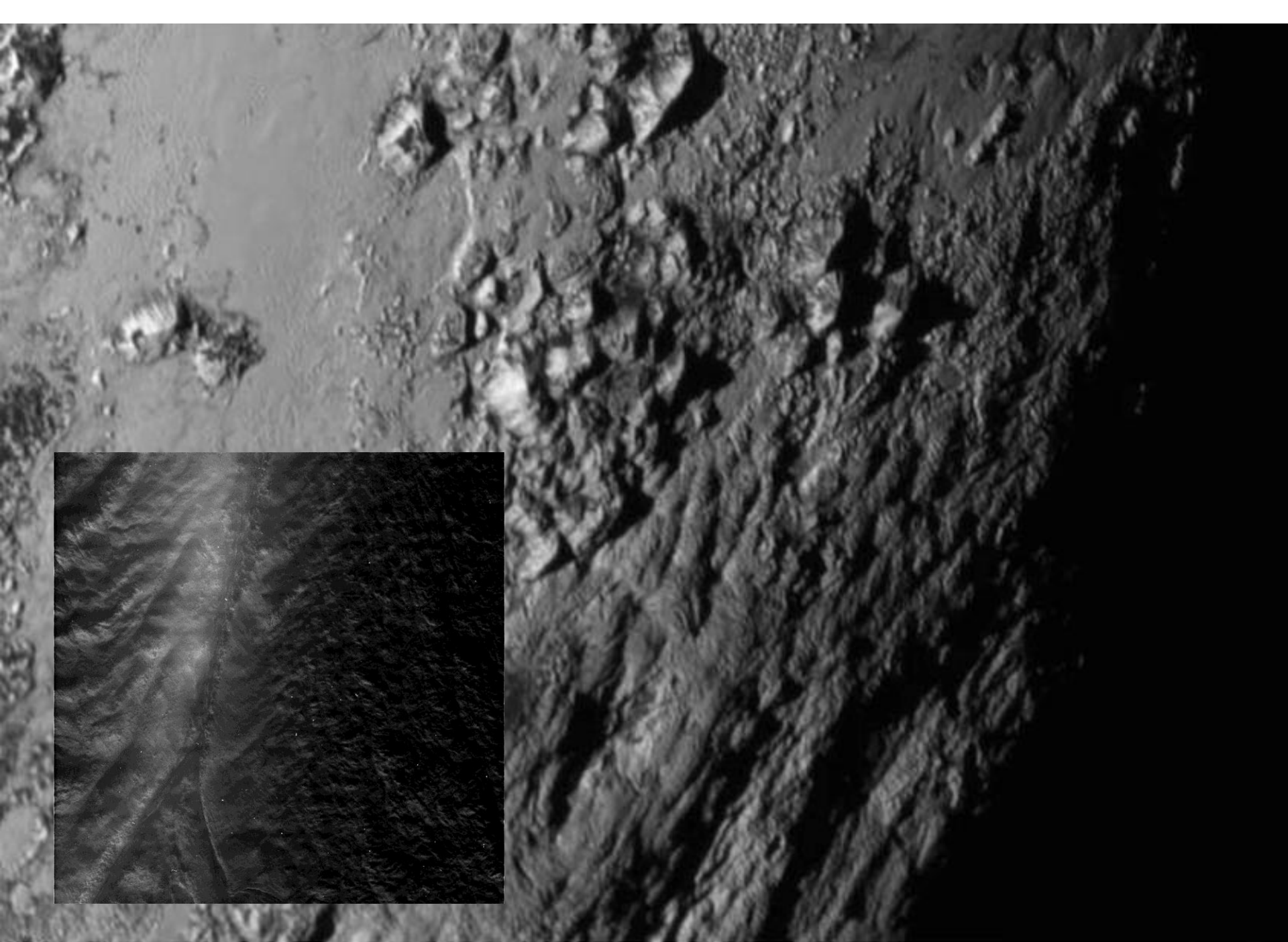


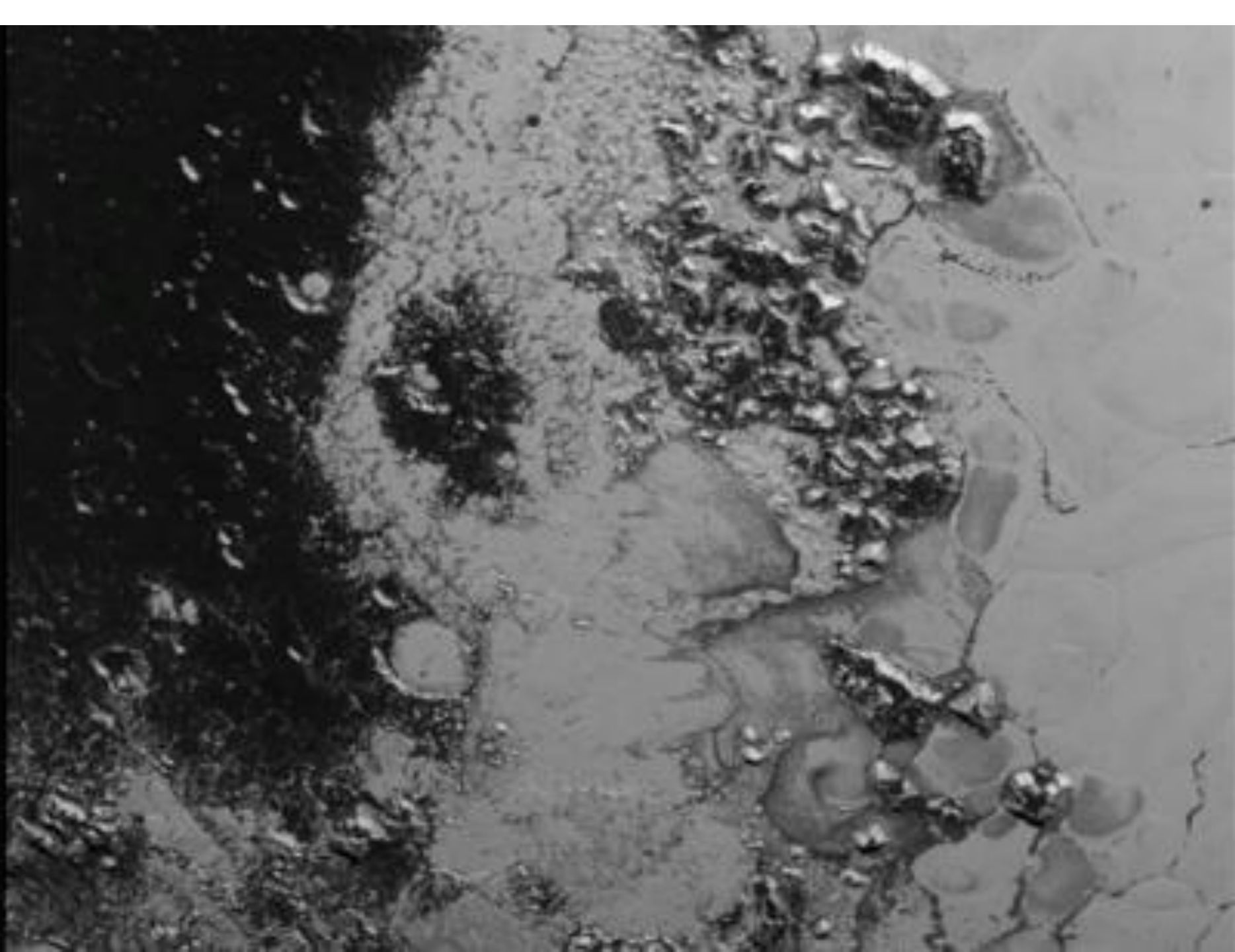
NH LORRI OPNAV CAMPAIGN 1

2014-07-19 02:30:00 UTC
Distance to Pluto: 429375336 Km
(Proper Motion)

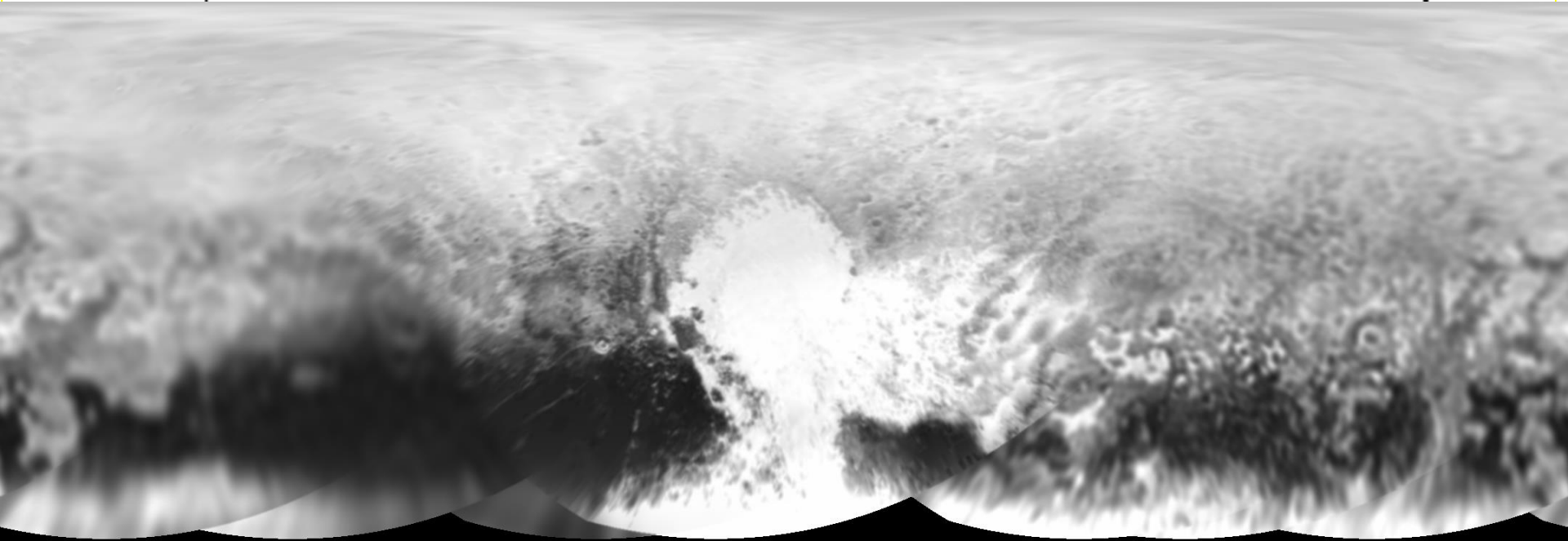
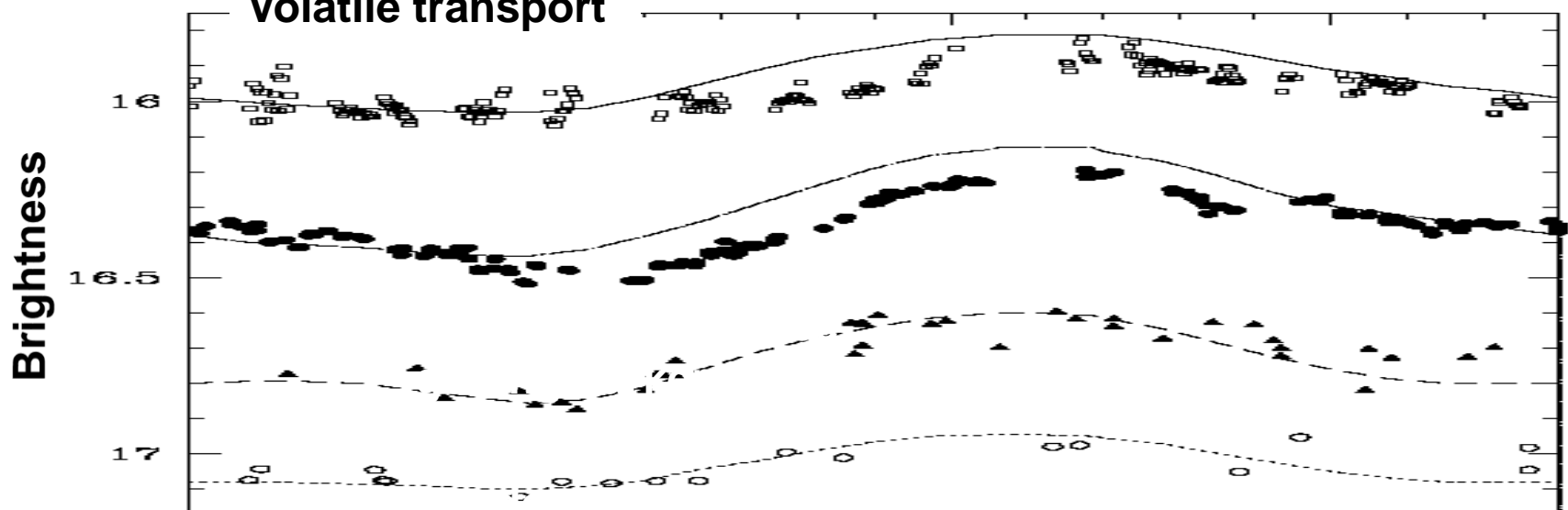




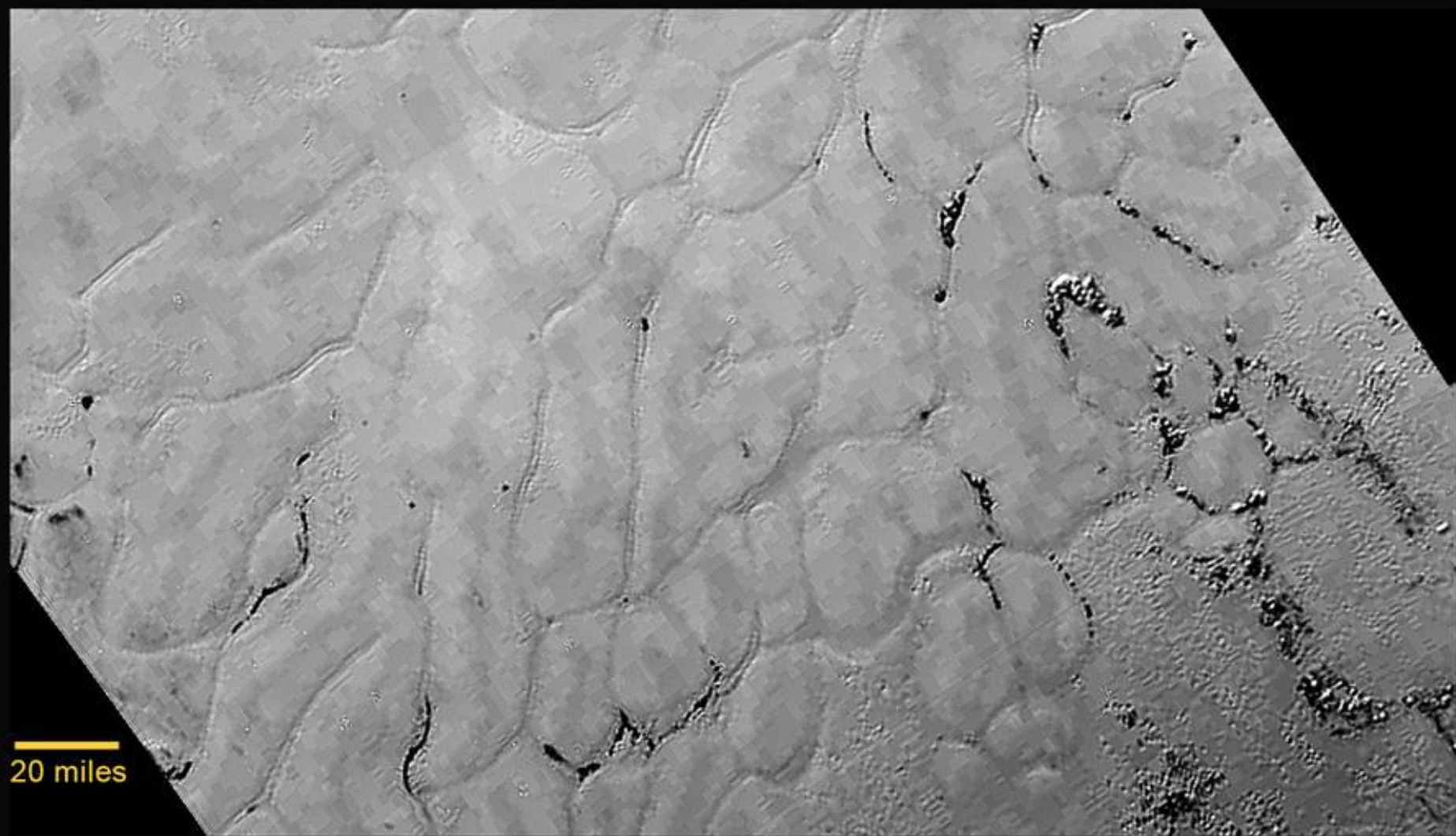


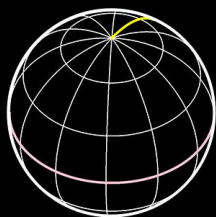
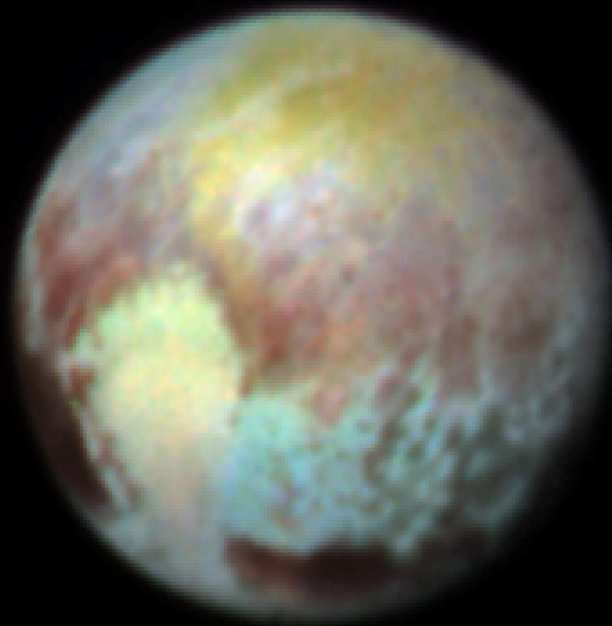


Volatile transport



The solid lines are no frost transport; the data show sublimation in the bright regions in the past few decades.





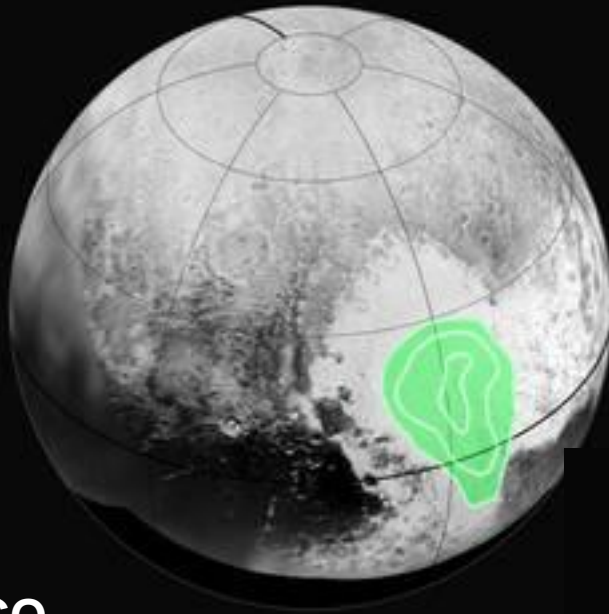
PLUTO'S BROKEN HEART IN FALSE COLOR

NASA NEW HORIZONS – RALPH INSTRUMENT

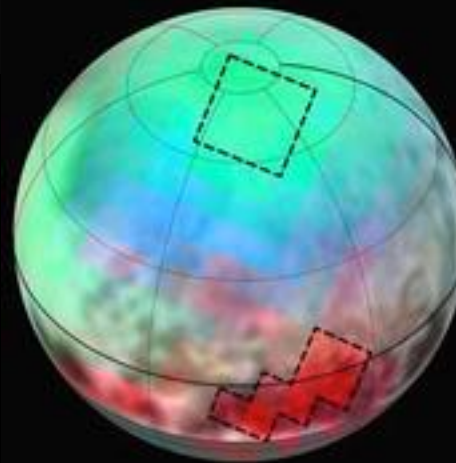
BLUE, RED, AND CH₄ FILTERS – IMAGED JULY 13 2015

Leisa spectrometer first results

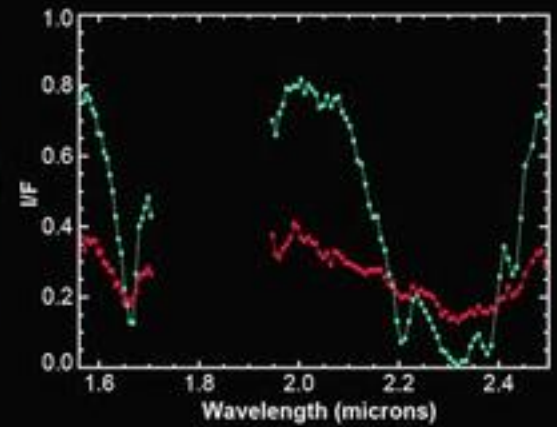
CO



Methane on Pluto



Infrared Spectral Image





Colors of Pluto and Charon



Nix and Hydra

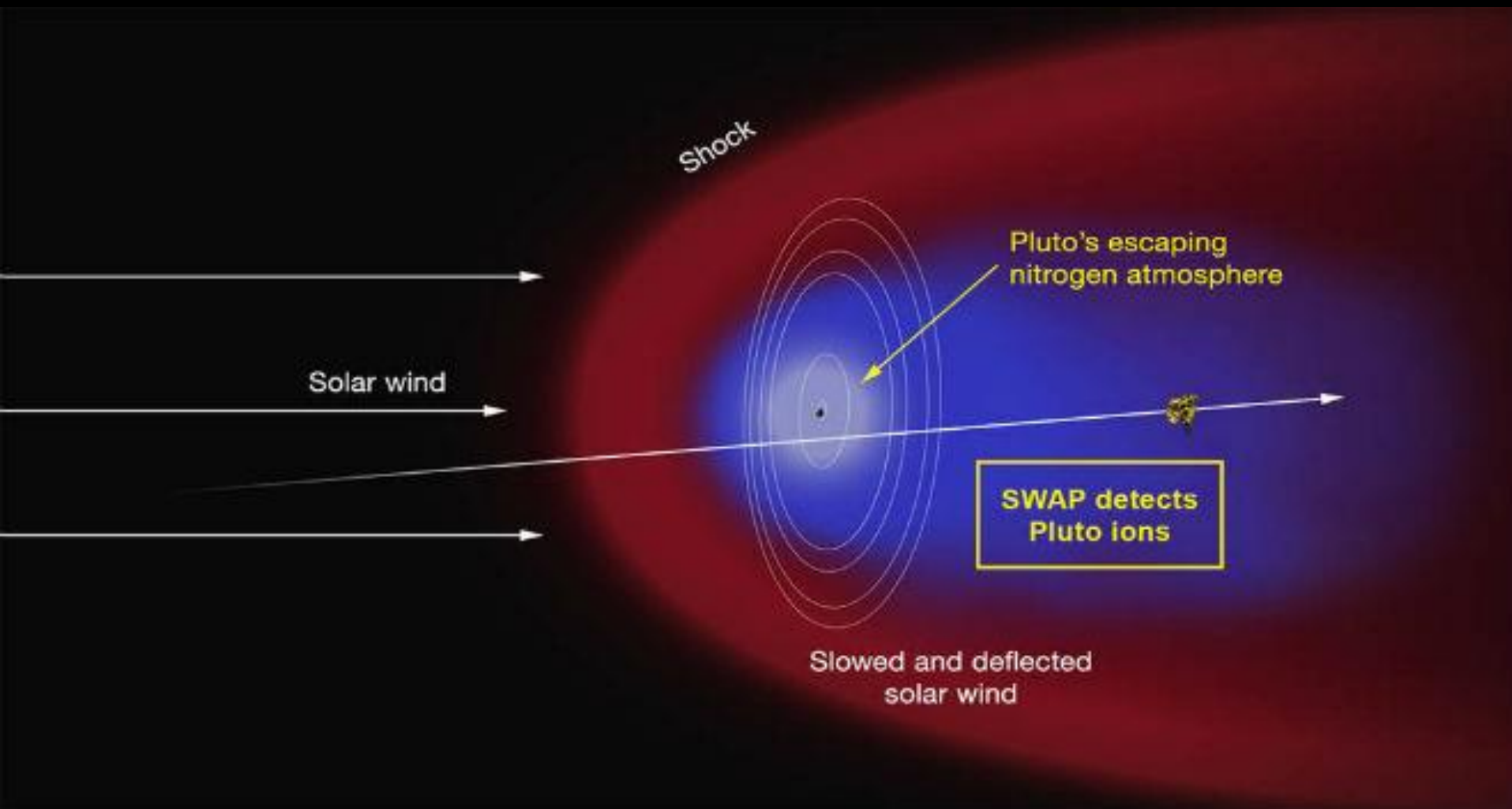


42X36 km



55X40 km

The magnetosphere of Pluto: It has a tail!



Young people (postdocs especially) and women powered the *New Horizons* project



Venetia Burney Student Dust Counter

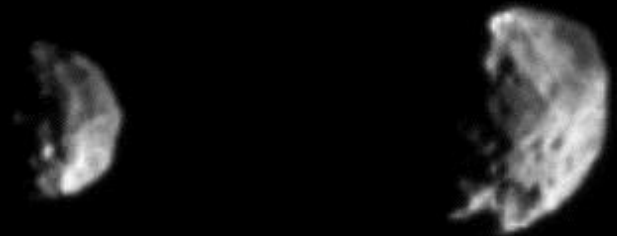


Conclusions and future work

- **Pluto has a complex geologic history, with evidence for seasonal volatile transport and active processes since its formation. Multiple events seem to have occurred. Many areas are crater-free**
- **There are multiple compositional units**
- **Most of data has yet to be returned.**

Extended mission

An extended KBO mission is planned, pending NASA approval. *New Horizons* plans on going to a small (<100 km) cold-disk KBO. At least two candidates were identified, with decision on the target due this summer.



Phoebe: a possible captured KBO similar to the one to be observed by *New Horizons*.

INTERNEED HEREIN
ARE REMAINS OF AMERICAN
CLYDE W. TOMBAUGH,
DISCOVERER OF PLUTO AND THE
SOLAR SYSTEM'S "THIRD ZONE."
ADELLE AND MURON'S BOY,
PATRICIA'S HUSBAND, ANNETTE
AND ALDEN'S FATHER,
ASTRONOMER, TEACHER, PUNSTER,
AND FRIEND:
CLYDE W. TOMBAUGH
(1906-1997)